PATENT

AMENDMENTS TO THE CLAIMS

Following is a complete set of claims as amended with this Response. This complete set of claims includes amended claims 1, 11, 20 and new claims 28-30.

1. (Currently Amended) An implantable medical device that delivers high voltage therapeutic signals to an organ of a patient, the device comprising:

an implantable delivery device that delivers the high voltage therapeutic signals to the organ of the patient;

a battery;

a converter coupled to the battery and to the implantable delivery device wherein the converter comprises at least one bypass capacitor and a switching network, wherein the at least one bypass capacitor is selectively connected to the battery via the switching network, wherein the at least one bypass capacitor ~~is a high frequency filter having~~ has a capacitance in the ~~microfarad~~ range of about 20-50 microfarads, and wherein the converter further comprises at least one delivery capacitor that is coupled to the implantable delivery device; and

a controller that induces the converter to change between a quiescent period and a charging cycle wherein the at least one bypass capacitor is connected to the battery during the charging cycle such that charge is accumulated in the bypass capacitor, wherein the delivery capacitor is also charged during the charging cycle based on the charge in the at least one bypass capacitor, and wherein the controller further controls the converter to disconnect the at least one bypass capacitor from the battery after completion of the charging cycle to reduce undesired dissipation of battery energy as a result of leakage currents during the quiescent period of the converter.

2. (Original) The device of Claim 1, wherein the implantable delivery device comprises at least one lead adapted to be implanted adjacent the heart of a patient so as to permit the delivery of high voltage therapeutic waveforms to the heart of the patient.

3. (Previously Presented) The device of Claim 1, wherein the converter comprises a transformer having a primary winding and a secondary winding wherein the switching network periodically connects the battery and the at least one bypass capacitor to the primary winding of the transformer so as to produce changing current in the primary winding that results in inductively induced changing current in the secondary winding and wherein the at least one delivery capacitor is connected to the secondary winding of the transformer such that the changing current results in the delivery of charge to the at least one delivery capacitor.

4. (Previously Presented) The device of Claim 3, wherein the switching network comprises a first switching element that is interposed between the at least one bypass capacitor, the battery and the primary winding of the transformer and wherein the controller induces the delivery of a high frequency signal to the first switching element so as to periodically connect the at least one bypass capacitor and the battery in parallel to the primary winding of the transformer.

5. (Previously Presented) The device of Claim 4, wherein the switching network further comprises a second switching element that connects the at least one bypass capacitor to the battery wherein the controller induces the second switching element to disconnect the at least one bypass capacitor from the battery during the quiescent periods of the converter.

6. (Original) The device of Claim 5, wherein the first and second switching elements comprise transistors having gates and wherein the controller applies an oscillating signal to the first transistor.

7. (Previously Presented) An implantable medical device that delivers high voltage therapeutic signals to an organ of a patient, the device comprising:

an implantable delivery device that delivers the high voltage therapeutic signals to the organ of the patient;

a battery;

a converter coupled to the battery and to the implantable delivery device wherein the converter comprises at least one bypass capacitor and a switching network, wherein the at least one bypass capacitor is selectively connected to the battery via the switching network, wherein the converter further comprises at least one delivery capacitor that is coupled to the implantable delivery device;

a controller that induces the converter to change between a quiescent period and a charging cycle wherein the at least one bypass capacitor is connected to the battery during the charging cycle such that charge is accumulated in the bypass capacitor, wherein the delivery capacitor is also charged during the charging cycle based on the charge in the at least one bypass capacitor, and wherein the controller further controls the converter to disconnect the at least one bypass capacitor from the battery after completion of the charging cycle to reduce undesired dissipation of battery energy as a result of leakage currents during the quiescent period of the converter;

wherein the converter comprises a transformer having a primary winding and a secondary winding wherein the switching network periodically connects the battery and the at least one bypass capacitor to the primary winding of the transformer so as to produce changing current in the primary winding that results in inductively induced changing current in the secondary winding and wherein the at least one delivery capacitor is connected to the secondary winding of the transformer such that the changing current results in the delivery of charge to the at least one delivery capacitor;

wherein the switching network comprises a first switching element that is interposed between the at least one bypass capacitor, the battery and the primary winding of the transformer and wherein the controller induces the delivery of a high frequency signal to the first switching element so as to

periodically connect the at least one bypass capacitor and the battery in parallel to the primary winding of the transformer;

wherein the switching network further comprises a second switching element that connects the at least one bypass capacitor to the battery wherein the controller induces the second switching element to disconnect the at least one bypass capacitor from the battery during the quiescent periods of the converter;

wherein the first and second switching elements comprise transistors having gates and wherein the controller applies an oscillating signal to the first transistor; and

a rectifying element that is interposed between the source of the oscillating signal and the second transistor such that when the oscillating signal is produced, the second transistor receives a substantially constant input voltage that turns on the transistor.

8. (Previously Presented) The device of Claim 26, further comprising a dissipation element that is interposed between the rectifying element and the battery such that, when the oscillating signal is not produced, the voltage on the gate of the transistor is turned off more quickly as a result of the voltage being dissipated through the dissipation element.

9. (Original) The device of Claim 8, wherein the rectifying element comprises a zener diode and the dissipation element comprises a resistor.

10. (Original) The device of Claim 1, wherein the at least one bypass capacitor comprises a plurality of ceramic capacitors and the at least one delivery capacitor comprises a plurality of electrolytic capacitors.

11. (Currently Amended) An implantable cardiac stimulation device comprising:

at least one lead adapted to be positioned adjacent the heart of the patient to thereby permit delivery of a high voltage therapeutic signal;

a battery that produces a low voltage output;

a converter that comprises at least one bypass capacitor and at least one delivery capacitor, wherein the converter in a charging cycle receives the low voltage output of the battery and charges the at least one bypass capacitor, wherein the at least one bypass capacitor ~~is a high frequency filter having~~ has a capacitance in the ~~microfarad~~ range of about 20-50 microfarads, and wherein charge is periodically delivered to the at least one delivery capacitor during the charging cycle such that the at least one delivery capacitor is charged to be able to deliver the high voltage therapeutic signal; and

a controller that determines the state of charge of the at least one delivery capacitor and induces the converter to enter the charging cycle when the controller determines that the at least one delivery capacitor is in need of charge to be able to deliver the high voltage therapeutic signal and wherein the controller disconnects the at least one bypass capacitor from the battery when the controller determines that the at least one delivery capacitor is not in need of charge to thereby inhibit undesired dissipation of battery energy as a result of leakage currents in the at least one bypass capacitor.

12. (Original) The device of Claim 11, wherein the converter comprises a transformer having a primary winding and a secondary winding wherein the battery and the at least one bypass capacitor are periodically connected to the primary winding of the transformer so as to produce changing current in the primary winding that results in inductively induced changing current in the secondary winding and wherein the at least one delivery capacitor is connected to the secondary winding of the transformer such that the changing current results in the delivery of charge to the at least one delivery capacitor.

13. (Original) The device of Claim 12, wherein the converter comprises a first switching element that is interposed between the at least one bypass capacitor, the battery and the primary winding of the transformer and wherein the controller induces the delivery of an alternating signal to the first switching

element so as to periodically connect the at least one bypass capacitor and the battery to the primary winding of the transformer.

14. (Original) The device of Claim 13, wherein the converter further comprises a second switching element that connects the at least one bypass capacitor to the battery wherein the controller induces the second switching element to disconnect the at least one bypass capacitor from the battery when the converter is not in the charging cycle.

15. (Original) The device of Claim 14, wherein the first and second switching elements comprise transistors and wherein the controller induces the application of the alternating signal to the first transistor.

16. (Previously Presented) An implantable cardiac stimulation device comprising:

at least one lead adapted to be positioned adjacent the heart of the patient to thereby permit delivery of a high voltage therapeutic signal;

a battery that produces a low voltage output;

a converter that comprises at least one bypass capacitor and at least one delivery capacitor wherein the converter in a charging cycle receives the low voltage output of the battery and charges the at least one bypass capacitor and wherein charge is periodically delivered to the at least one delivery capacitor during the charging cycle such that the at least one delivery capacitor is charged to be able to deliver the high voltage therapeutic signal;

a controller that determines the state of charge of the at least one delivery capacitor and induces the converter to enter the charging cycle when the controller determines that the at least one delivery capacitor is in need of charge to be able to deliver the high voltage therapeutic signal and wherein the controller disconnects the at least one bypass capacitor from the battery when the controller determines that the at least one delivery capacitor is not in need of charge to thereby inhibit undesired dissipation of battery energy as a result of leakage currents in the at least one bypass capacitor;

wherein the converter comprises a transformer having a primary winding and a secondary winding wherein the battery and the at least one bypass capacitor are periodically connected to the primary winding of the transformer so as to produce changing current in the primary winding that results in inductively induced changing current in the secondary winding and wherein the at least one delivery capacitor is connected to the secondary winding of the transformer such that the changing current results in the delivery of charge to the at least one delivery capacitor;

wherein the converter comprises a first switching element that is interposed between the at least one bypass capacitor, the battery and the primary winding of the transformer and wherein the controller induces the delivery of an alternating signal to the first switching element so as to periodically connect the at least one bypass capacitor and the battery to the primary winding of the transformer;

wherein the converter further comprises a second switching element that connects the at least one bypass capacitor to the battery wherein the controller induces the second switching element to disconnect the at least one bypass capacitor from the battery when the converter is not in the charging cycle;

wherein the first and second switching elements comprise transistors and wherein the controller induces the application of the alternating signal to the first transistor; and

a rectifying element that is interposed between the source of the alternating signal and the second transistor such that when the alternating signal is produced, the second transistor receive a substantially constant input voltage that turns on the second transistor.

17. (Previously Presented) The device of Claim 27, further comprising a dissipation element that is interposed between the rectifying element and the battery such that when the alternating signal is not produced, the voltage on the gate of the second transistor is turned off more quickly as a result of the voltage being dissipated through the dissipation element.

18. (Original) The device of Claim 17, wherein the rectifying element comprises a zener diode and the dissipation element comprises a resistor.

19. (Original) The device of Claim 11, wherein the at least one bypass capacitor comprises a plurality of ceramic capacitors and the at least one delivery capacitor comprises an electrolytic capacitor.

20. (Currently Amended) An implantable medical device that delivers high voltage therapeutic signals to an organ of a patient, the device comprising:

delivery means for delivering a high voltage therapeutic signal to the organ of the patient;

a battery that provides a low voltage output;

converter means for converting the low voltage output to the high voltage therapeutic signal; and

means for selectively disconnecting at least a portion of the converter means from the battery when the low voltage output is not being converted to the high voltage therapeutic signal so as to reduce undesired dissipation of the battery as a result of leakage current through at least a portion of the converter means;

wherein the converter means comprises a transformer with a primary and a secondary winding, at least one bypass capacitor coupled to the primary winding of the transformer, and at least one delivery capacitor coupled to the secondary winding of the transformer; and

wherein the bypass capacitor ~~is a high frequency filter having~~ <u>has</u> a capacitance in the ~~microfarad~~ range <u>of about 20-50 microfarads</u>.

21. (Original) The device of Claim 20, wherein the delivery means comprises a lead adapted to be implanted adjacent an organ of the patient so as to be able to deliver high voltage therapeutic stimulation to the organ of the patient.

22. (Original) The device of Claim 21, wherein the lead is adapted to be implanted adjacent the heart of the patient so as to deliver defibrillation shocks.

23. (Cancelled)

24. (Previously Presented) The device of Claim 22, wherein the means for selectively disconnecting the converter means comprises:

a first transistor coupled between the at least one bypass capacitor, the battery and the primary winding of the transformer;

a second transistor coupled between the first plate of the at least one bypass capacitors and the battery; and

a gate drive element that provides an alternating signal to the first transistor and a constant signal to the second transistor when providing the alternating signal to the first transistor, wherein the at least one bypass capacitor accumulates charge when the alternating signal is low and provide the charge to the primary winding when the alternating signal is high so as to produce changing currents in the transformer that results in the accumulation of charge in the at least one delivery capacitor.

25. (Original) The device of Claim 24, wherein the means for selectively disconnecting the converter means comprises a controller that monitors the state of charge of the at least one delivery capacitor and disables the constant signal to the second transistor so as to disconnect the at least one bypass capacitor and the battery.

26. (Previously Presented) The device of claim 6, further comprising a rectifying element that is interposed between the source of the oscillating signal and the second transistor such that when the oscillating signal is produced, the second transistor receives a substantially constant input voltage that turns on the transistor.

27. (Previously Presented) The device of Claim 15, further comprising a rectifying element that is interposed between the source of the alternating signal and the second transistor such that when the alternating signal is produced, the second transistor receives a substantially constant input voltage that turns on the second transistor.

28. (New) The device of Claim 1, wherein the at least one bypass capacitor is a high frequency filter.

29. (New) The device of Claim 11, wherein the at least one bypass capacitor is a high frequency filter.

30. (New) The device of Claim 20, wherein the at least one bypass capacitor is a high frequency filter.